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POSITIONING AND TRACING SYSTEM STUDY OF ALL TERRAIN FOREST FIRE PATROLLING AND FIGHTING VEHICLE

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ABSTRACT

All terrain vehicles (ATV) is a non-road vehicle which has the performance such as mass low, operation flexible, stridden and so on. This vehicle also has fire extinguishing equipment, could patrol at forest area, and then could find fire and fighting.

As our country's virgin has no people, and invisibility is bad. When fire happens, the ATV will influence the fire fighting efficiency, so judge position is difficult. Therefore, the ability of GPS for ATV is necessary. Using GPS and wireless network for fire location and arrange robot could get high precision and safety, and could detect position and range timely and quickly. This could provide fire basis for interrelated department. The fire sensor will sense when the fire occurs and then the vehicle will be controlled from the control section via Zigbee transceiver. The GPS value will be transmitted to the control section via Zigbee to intimate the location of the fire accident. The user has to control the water tank in the vehicle via Zigbee to clear the fire. Here we are using an ARM7 (LPC2148) microcontroller with camera that captures images and sends it to the controller.

KEYWORDS: ATV, Fire-Fighting, Camera, GPS, All Terrain

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Original Article

INTRODUCTION

At present, traditional forest fire prevention measures were ground patrolling, watching tower, aerial prevention, long distance video detection and satellite monitoring and so on. In view of all the deficiencies of conventional forest fire detection, it's necessary to bring in a new method for effective supplements to an Omni-bearing and stereoscopic air and ground forest-fire detection pattern. In the wireless sensor network, a mass of integrated micro sensor nodes were deployed in the monitoring area, and all kinds of targeted environment information were gathered by the cooperative nodes, those information were conducted by embedded systems, then transferred to the user. For the forest fire detection, the nodes deployed in the forest collected the dynamic changing fire information such as temperature, humidity and atmospheric pressure real-timely. The wireless sensor network technique accompanied with satellite monitoring, aerial patrolling and manual watching, sets up an Omni-bearing and stereoscopic air and ground forest-fire detection pattern, for the relevant departments to quickly take the appropriate measures to fight the fire or to provide basis for decision making we introduce the technique ATV. All terrain vehicles (ATV) is a non-road vehicle which has the performance such as mass low, operation flexible, stridden and so on. Using GPS and wireless network the patrol route and position should be controlled by command center. When fire happens the center could realize direction and location timely, and let robot moves to left, right,

forward and backward through command centre operates keypad. The vehicle is connected with the microcontroller, fire sensor, GPS, water tank, robot and Zigbee transceiver. The control section is connected with the microcontroller, Zigbee transceiver, and keypad. The fire sensor will sense when the fire occurs and then the vehicle will be controlled from the control section via Zigbee transceiver. The GPS value will be transmitted to the control section via Zigbee to intimate the location of the fire accident. The user has to control the water tank in the vehicle via Zigbee to clear the fire. Here we are using an ARM7 (LPC2148) microcontroller with camera that captures images and sends it to the controller.The different applications that we are going to implement here are Controlling a robot Controlling the sensors

SYSTEM DESIGN MODEL

This paper consists of two sections. They are the controlling section which controls the robot and monitoring sections which monitors the received data. The block diagrams of these sections are given below:

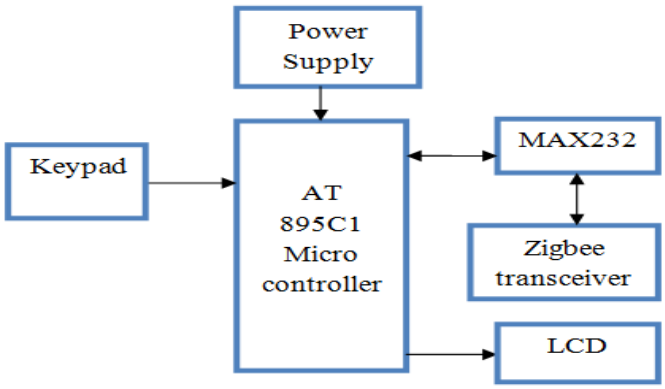

Figure 1: Controlling Section Block Diagram

In this work, we propose an innovative adaptive mechanism that with the help of Keypad we used to control the robot and if any fire is detected in the forest, then monitoring section sends a message via Zigbee to the controlling section Zigbee transceiver and from there it is sent to micro controller and a message is displayed on the LCD. The next we have is Monitoring section. It consists of ARM7 (LPC2148) microcontroller. The vehicle is connected with the fire sensor, GPS, water tank, robot, camera, and Zigbee transceiver. When fire occurs the fire sensor will detect and send the GPS values to the control section via Zigbee to intimate the location of the fire accident. The user has to control the water tank in the vehicle via Zigbee to clear the fire. Here we are using an ARM7 (LPC2148) microcontroller with camera that captures images and sends it to the controller

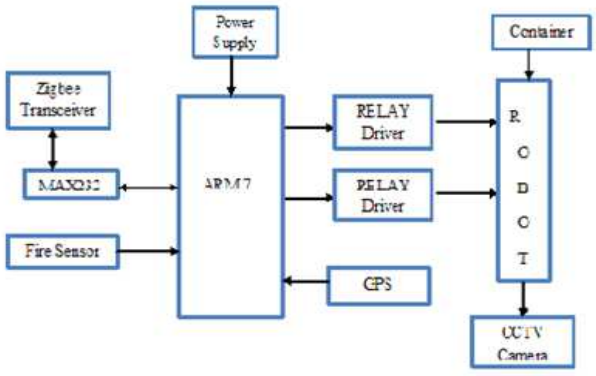

Figure 2: Monitoring Section

ZIGBEE

Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor. We are using Zigbee communication as it is simple without any complexity compared to Bluetooth and IEEE 802.11b. Zigbee is a specification for high level communication protocols used to create personal area networks built from small, low-power digital radios. Zigbee is used in applications that require a low data rate, long battery life, and secure networking. Zigbee has a defined rate of 250kbit/s, best suited for periodic or intermittent data or a single signal transmission from a sensor or input device. Zigbee devices are of three types Zigbee Coordinator (ZC), Zigbee Router (ZR), Zigbee End Device (ZED). Zigbee builds upon the physical layer and media access control defined in IEEE standard 802.15.4 (2003 version) for low-rate WPANs. The specification goes on to complete the standard by adding four main components: network layer, application layer, Zigbee device objects (ZDOs) and manufacturer-defined application objects which allow for customization and favor total integration. Besides adding two high-level network layers to the underlying structure, the most significant improvement is the introduction of ZDOs. These are responsible for a number of tasks, which include keeping of device roles, management of requests to join a network, device discovery and security Applications include wireless light switches, traffic management systems, and other consumer and industrial equipment that require short-range wireless transfer of data at relatively low rates. The technology defined by the Zigbee specification is intended to be simpler and less expensive than other WPANs, such as Bluetooth or Wi-Fi.

RS232 CABLE

To allow compatibility among data communication equipment, an interfacing standard called RS232 is used. Since the standard was set long before the advent of the TTL logic family, its input and output voltage levels are not TTL compatible. For this reason, to connect any RS232 to a microcontroller system, voltage converters such as MAX232 are used to convert the TTL logic levels to the RS232 voltage levels and vice versa.

MAX 232

Max232 IC is a specialized circuit which makes standard voltages as required by RS232 standards. This IC provides best noise rejection and very reliable against discharges and short circuits. MAX232 IC chips are commonly referred to as line drivers. To ensure data transfer between PC and microcontroller, the baud rate and voltage levels of Microcontroller and PC should be the same. The voltage levels of microcontroller are logic1 and logic 0 i.e., logic 1 is +5V and logic 0 is 0V. But for PC, RS232 voltage levels are considered and they are: logic 1 is taken as -3V to -25V and logic 0 as +3V to +25V. So, in order to equal these voltage levels, MAX232 IC is used. Thus this IC converts RS232 voltage levels to microcontroller voltage levels and vice versa

Global Positioning System (GPS)

The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. The system provides critical capabilities to military, civil and commercial users around the world. It is maintained by the United States government and is freely accessible to anyone with a GPS receiver. A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites high above the Earth Each satellite continually transmits messages that include, The time the message is transmitted, Precise orbital information, The general system health and rough orbits of all GPS satellites. The receivers use the messages to determine the transit time of each message

and compute the distance to each satellite. These distances along with the satellites locations are used with the possible aid of trilateration, depending on which algorithm is used, to compute the position of the receiver. This position is then displayed, perhaps with a moving map display or latitude and longitude elevation information may be included. Many GPS units show derived information such as direction and speed, calculated from position changes.

FIRE SENSOR

The Fire sensor is used as a simple and compact device for protection against fire. The module makes use of IR sensor and comparator to detect fire up to a range of 1 - 2 meters. The device, weighing about 5 grams, can be easily mounted on the device body. It gives a high output on detecting fire. This output can then be used to take the requisite action. An on-board LED is also provided for visual indication.

Firm Ware Integration

This is an Operating System (OS) on which all the software applications required for our design are going to be run. This OS is flexible to any user to operate and easy to understood. Accessing the soft wares and using them is very convenient to user. Or-CAD is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly to create electronic prints for manufacturing of printed circuit boards, by electronic design engineers and electronic technicians to manufacture electronic schematics. The µVision development platform is easy-to-use and it helps you quickly create embedded programs that work. The µVision IDE (Integrated Development Environment) from Keil combines design management, source code editing, program debugging, and complete simulation in one powerful environment. Code written in 'EMBEDDED C'.

EXPERIMENTAL RESULTS

In this project when the fire sensor sense the fire the GPS track the location and sends the information with the help of Zigbee to controlling section and the with the help of sprinkler we sprinkle the water where the fire occurred.

STEP1: In this step we need to switch on the power supply and the LCD display the title as "AVT tracking system" and then we need to reset the system by pressing the reset. Then the process moves to the next step i.e. step 2

STEP2: In this step we have the controlling section which has the key pad to control the directions of the robot and Zigbee transceiver receives the message from monitoring section and passes the message to microcontroller which displays it on the LCD. and then the process moves to the next step i.e. step3.

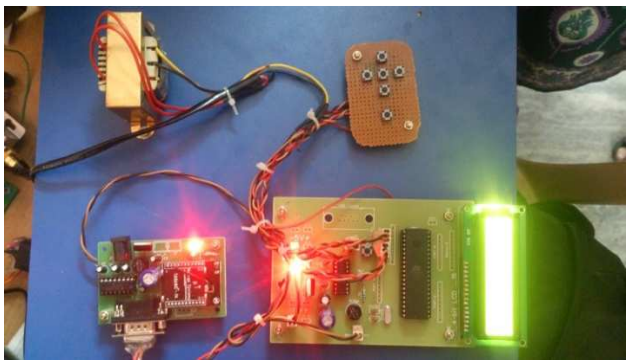

Figure 3

STEP3: In this step the longitude and latitude values received from the GPS present in the monitoring section along with these values displaying the message “ACCIDENT OCCURRED”, when fire is detected the water is sprinkled on fire while doing that we can control the robot using keypad. and then the process moves to the next step i.e. step4.

Figure 4

STEP 4: In this step the monitoring section which has fire sensor to detect if any fire occurs in the forest while surveillance can be done by using the camera. If fire is detected then longitude and latitude values are read by the GPS system which sends the data to the microcontroller and is transferred to the controlling section with the help of the Zigbee transceiver. Then the process moves to the next step i.e. step 5.

STEP5: In this step the water sprinkled on the fire when fire is detected in the forest while patrolling. The sprinkler can be stopped by the controlling section; the relay unit is used to control the sprinkler by the controlling section. This process repeats continuously.

Figure 5

CONCLUSIONS

This work presents that robot is controlled using controlling section. An embedded system is created with micro controller ARM7 on the transmission side along with Zigbee and GPS. The fire sensor will sense when the fire occurs and then the vehicle will be controlled from the control section via Zigbee transceiver. The GPS value will be transmitted to the control section via Zigbee to intimate the location of the fire accident. The user has to control the water tank in the vehicle via Zigbee to clear the fire. In additionally a wireless camera is used. A wireless camera captures the image and using the tuner card we can display the image on our PC. By this it would be comfortable to the mankind to control the robot from his place. By using control section in different directions, we can make a Robot move accordingly. ATV using GPS, through centre server, could realize the trace and controlled timely for patrol route. Those are very useful for forestry fire early finding, information transmission, fire fighting quickly, especially for Chinese forestry area.

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